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LLNL-CONF-654779

Atmospheric Source Estimation With Uncertainty Quantification For Urban Scales

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May 22, 2014

18th Annual GMU Conference on Atmospheric Transport and Dispersion Modeling
Fairfax, VA, United States
June 23, 2014 through June 29, 2014

Disclaimer

Abstract for the 18th Annual GMU Conference on Atmospheric Transport and Dispersion Modeling

Title: *"Atmospheric Source Estimation With Uncertainty Quantification For Urban Scales"*

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Abstract: The magnitude, location, and duration of atmospheric releases can be estimated using inverse methods that optimally combine measurements and simulations from atmospheric transport models. Uncertainties in the measurements and models can limit the ability to constrain source characteristics, and may lead to incorrect inferences if not incorporated into the inversion analysis. We describe a recent effort initiated at the Lawrence Livermore National Laboratory to estimate uncertainties in atmospheric releases using Monte Carlo-based inversion and ensemble meteorological and dispersion modeling. We present results highlighting the effects of meteorological uncertainties on source estimations for the 2003 Oklahoma City tracer release experiment. Using measurements of wind and tracer concentrations, we compute probability density functions (PDFs) for inflow conditions for Oklahoma City using AEOLUS, and then propagate these PDFs through the system to constrain the source location. Inflow uncertainties are shown to have a pronounced effect on the estimated source locations. We also describe strategies for incorporating measurement and model errors in the inversion, and methods for efficiently sampling the space of possible release locations. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344 and was funded by Laboratory Directed Research and Development at LLNL under project tracking code 14-ERD-006 (UCRL LLNL-CONF-654779).

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